

# SYSTEM & METHOD FOR DYNAMICALLY LABELED TOUCH SENSITIVE BUTTONS IN A DIGITIZING DISPLAY

This application is a continuation application of Ser. No. 08/055,067, filed Apr. 29, 1993, now abandoned.

## BACKGROUND OF THE INVENTION

### 1. Technical Field

The invention disclosed broadly relates to data processing systems and more particularly relates to improvements in input/output devices for pen-based computer systems.

### 2. Related Patents and Patent Applications

The following patents and patent applications are assigned to the IBM Corporation and are incorporated herein by reference.

U.S. Pat. No. 4,686,332 entitled "Combined Finger Touch and Stylus Detection System for Use on the Viewing Surface on a Visual Display Device," by Evon C. Greanias, et al.

U.S. Pat. No. 5,007,085 entitled "Remotely Sensed Personal Stylus," by Evon C. Greanias, et al.

U.S. Pat. No. 5,117,071 entitled "Stylus Sensing System," by Evon C. Greanias, et al.

Copending U.S. patent application Ser. No. 07/778,431, filed Oct. 16, 1991 entitled "Touch Overlay for Improved Touch Sensitivity," by Evon C. Greanias, et al.

Copending U.S. patent application Ser. No. 07/351,227, filed May 15, 1989 entitled "Flat Touch Screen Workpad for a Data Processing System," by Gordon W. Arbeitman, et al.

Copending U.S. patent application Ser. No. 07/969,864, filed Oct. 30, 1992 entitled "Architecture for Communication of Remote Devices to a Digitizing Display" by Guy F. Verrier, et al.

3. Background Art

Pen-based computer systems have been described in the prior art, for example in the above referenced U.S. Pat. No. 4,686,332 by Greanias, et al. In that system, a touch overlay membrane is positioned over the viewing surface of a display device such as a computer monitor, for interacting with a pickup stylus. The pickup stylus described in the '332 patent is connected by means of a wire to the pen-based computer system. The pen-based computer system generates a radiative signal in the touch overlay. The radiative signal is picked up by the stylus and sent back over the wire to the pen-based computer. The computer then calculates the relative X-Y position of the stylus with respect to the overlay. The relative proximity Z of the stylus to the overlay is determined by the signal amplitude picked up by the stylus from the electromagnetic energy radiated from the overlay. An improvement in the stylus pickup antenna is described in the above cited U.S. Pat. No. 5,117,071 by Greanias, et al. In the '071 patent, the antenna configuration in the tip of the stylus is a small sphere, whose shape enables a uniform signal strength to be picked up without regard for the relative orientation of the stylus with respect to the planar surface of the overlay. A further improvement has been made to the stylus by eliminating the cable connection between the stylus and the pen-based computer system, as is described in U.S. Pat. No. 5,007,085 by Greanias, et al. In the '085 patent, the signal detected by the stylus antenna which has been picked up from the electromagnetic radiation emitted by the overlay, is converted into a second signal which is transmitted either by infrared radiation, microwave radiation or radio frequency radiation at a different frequency, from the stylus back to an electromagnetic detector coupled to the

pen-based computer system. Another improvement to pen-based computer systems is described in the above referenced copending U.S. patent application Ser. No. 07/351,227, filed May 15, 1989 by Arbeitman, et al. In the Arbeitman, et al. patent application, a flat touch screen workpad is substituted for the combination of the computer display monitor and touch overlay membrane. In the Arbeitman, et al. patent application, the radiative pickup stylus is connected by means of a wire to the flat touch screen workpad, for receiving the electromagnetic radiation emanated from the overlay membrane, the wire transferring the detected signal from the pickup stylus back to the electronics contained in the flat touch screen workpad.

In the description of the invention contained herein, the term "digitizing display" will be used to generally refer to either the combination of a computer display monitor and touch overlay membrane described in the '085 patent or alternately, the workpad display and overlay described in the Arbeitman, et al. patent application.

The above cited U.S. Pat. No. 5,007,085 entitled "Remotely Sensed Personal Stylus," by Evon C. Greanias, et al., describes a pen-based computer system which has a digitizing display which radiates electromagnetic signals which are picked up by a remotely sensing personal stylus. The antenna in the tip of the stylus picks up the electromagnetic signals radiated from the display overlay, and converts those signals into a suitable form for retransmission back to the pen-based computer system. The relative signal strength of the signals picked up by the stylus is used to infer the relative separation distance Z of the tip of the stylus with respect to the overlay. The converted signals are transmitted back to the pen-based computer system by means of a transmitting circuit and transmitting antenna within the stylus. The technique for determining contact between the stylus tip and the surface of the overlay, is by measuring the relative signal strength of the electromagnetic signal picked up by the tip of the stylus.

A problem with this prior art is that the detection of actual touchdown of the stylus onto the workpad surface is not very sensitive. Consider in normal handwriting how the writer's hand pressure varies during the course of writing a signature. The pressure applied by the pen to the paper varies over the course of inscribing the signature on the paper and sometimes includes a slight raising of the pen from the surface of the paper. The process of writing a signature on a digitizing display by means of a radiative pickup stylus, does not faithfully reproduce the intended shape on the display screen. When the stylus is raised slightly from the surface of the digitizing display, the separation of the stylus tip from the surface will not be detected in prior art systems. What results is spurious traces and artifacts which remain in the "inked" depiction of the user's signature because the system cannot detect the actual small separation of the stylus from the surface of the digitizing display. This problem has been solved by the invention described in the above identified copending patent application Ser. No. 07/969,864 by Guy F. Verrier, et al.

Function keys on keyboards and mouse buttons are used today with personal computers to inform the computer and application programs of a user input selection. The flat touch screen workpad described in the above identified Arbeitman, et al. copending patent application, also provides buttons on the front bezel to provide function key, shift key and mouse buttons. Users of keyboard buttons have difficulty in remembering the meaning of the unlabeled buttons on keyboards and workpads of the prior art. In addition, the use of a control, alternate, or shift key in conjunction with other key